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AUTHOR Sia, Archibald P.
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ABSTRACT

This document reports on a study which indicated that there are three critical predictors that explain variability in environmental behavior. These predictors are: (1) perceived skill in using environmental action strategies; (2) level of environmental sensitivity; and (3) perceived knowledge of environmental action strategies. From these results, a model of teaching pro-environmental behavior was developed. This five-phase model showed how environmental education was integrated in the curriculum. The phases included developing environmental sensitivity, looking into environmental problems, checking one's beliefs, values, and attitudes, tackling environmental problems and getting into citizen action. (Author/TW)

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CHALLENGE TO PRESERVICE EDUCATION:
INTEGRATING ENVIRONMENTAL EDUCATION IN THE SCHOOL CURRICULA *

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Archibald P. Sia, Ph.D.
Assistant Professor, Rockhurst College
Kansas City, Missouri

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ABSTRACT

A study conducted by the presenter indicated that there are three critical predictors that explain variability in environmental behavior. These predictors are perceived skill in using environmental action strategies, level of environmental sensitivity, and perceived knowledge of environmental action strategies. From these results, a model of teaching pro-environmental behavior was developed. This five-phase model showed how environmental education is integrated in the curriculum.

Introduction

The goal of environmental education (EE) is the promotion of responsible environmental behavior (Hungerford & Peyton, 1976; Roth, 1970; Stapp, 1969). We, educators, are charged with promoting this goal among our citizenry. Since environmental education invades virtually every discipline, the presenter believes that environmental education must be viewed holistically, rather than treated as an isolated subject. This is a challenge to us, teacher educators i.e., how our preservice teachers can integrate environmental education in the school curricula. Prior to tackling this practical consideration, a study providing an empirical base for carrying out the environmental education goal is presented on the the following pages.

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I. The Study: Predictors of Environmental Behavior

Research indicates that the EE goal is not directly addressed by both curriculum developers and instructional practitioners (Tomera, Hungerford, & Wilson, 1982; Volk, 1983; Sia, 1984). This goal of promoting responsible environmental behavior may not be given due consideration because there has been a "paucity of data available to help in the understanding, predicting, and modifying of these behaviors" (Maloney & Ward, 1973). This is in agreement with Linke's (1980) observation that there is a lack of knowledge of those factors which influence the development of environmentally responsible behavior.

Purpose. This research was an attempt to incorporate several variables, some theoretical (Hungerford & Tomera, in press) and others empirically established as having predictive power (Arbuthnot, 1977; Borden, 1979; Borden & Powell, 1983; Borden & Francis, 1978) into a single investigation. Its purpose was to determine these variables' relative strength in predicting responsible environmental behavior. These predictor variables were: (1) level of environmental sensitivity [LES], (2) perceived knowledge of environmental action strategies [KNOW], (3) perceived skill in using environmental action strategies [SKILL], (4) perceived individual locus of control [ILOC], (5) perceived group locus of control [GLOC], (6) psychological sex role classification [SEX ROLE], (7) belief in/attitude towards pollution [POL] and (8) belief in/attitude towards technology [TECH].

Taking these variables together, the most parsimonious set of variables which best predicts environmental behavior was identified.

Instrumentation. A sixteen-page instrument was developed. This was judged valid by a team of five science/environmental educators. Briefly, the instrument elicited (a) demographic information, (b) the number of environmental actions by the respondent during the past year (the dependent variable), and (c) information on the eight predictor variables.

Samples. Two-distinct groups participated in the study: Sierra Club (SC) and Elderhostel (EH) members. One-hundred and seventy-one (171) usable instruments were collected (SC = 105; EH = 66).

Methods of Data Analysis. Utilizing the Statistical Analysis System computer package (SAS, 1979), instrument data were analyzed by (1) tabulating means, standard deviations, and intercorrelations among the demographic, criterion, and predictor variables, (2) classifying total behavior scores to establish low, medium, and high scores among all respondents (regardless of sample membership), (3) ANOVA and regression analysis to determine significant differences between high and low behavior scores on their behavior and predictor variable scores, (4) multiple regression analysis to determine relative contribution of the eight predictor variables to the dependent variable-environmental behavior, (5) determining intercorrelations between dependent and predictor variables, and (6) stepwise regression (MAXR) to identify the most parsimonious set of variables that predicts environmental behavior for the total sample as well as for SC and EH memberships separately.

Results. Analysis of the data indicated that the SC sample was characterized as a relatively young mixture of single and married highly educated individuals with at least a college degree, occupying

diverse professions. The majority had taken environmental courses of which ecology was the typical course taken. Most held memberships in an average of two environmental organizations. The most frequently identified organizations were the Sierra Club, the Audubon Society, and the Nature Conservancy, respectively. Most had read/subscribed to an average of two environmental publications.

On the other hand, the EH sample was characterized as a group of elderly and retired, married, college educated respondents. The majority had not taken courses regarding environmental concern. Most held memberships in an average of one environmental organization. The most frequently identified organizations were the Audubon Society, the Nature Conservancy, and the National Wildlife Federation. Most had read/subscribed to an average of one environmental publication.

When the entire set of respondents was classified into low, medium, and high behavior groups on the basis of their environmental behavior scores, the following action subgroups resulted: (1) low = 45 respondents with behavior scores ranging from 3-19, (2) medium = 80 respondents with scores ranging from 20-49, and (3) high = 46 respondents with scores ranging from 50 - upwards.

Tests of group differences on the eight predictor variables indicated that the high and low behavior groups differed significantly in all predictor variables, except in belief in/attitude towards technology.

From the comparative findings on the dependent measure and the predictor variables describing both high and low behavior groups, as shown in Table 1, a high environmental activist profile

emerges: (1) versatility in utilizing the environmental action categories in taking environment action, (2) substantial knowledge of and moderate skill in the use of environmental action strategies, (3) a considerable degree of environmental sensitivity (4) a perception of being moderately effective as an individual but more so as a group member (i.e., the locus of control variables), (5) a moderately negative attitude towards pollution, (6) a slightly ambivalent attitude towards technology, and (7) likely to be androgynous in psychological sex role classification.

Table 1 goes about here

Putting all the eight predictors in a stepwise regression (MAXR) equation with the criterion measure indicated that the most parsimonious set of variables which predicts responsible environmental behavior included: (1) SKILL ($F_{1,169} = 89.16$; $p < .0001$), accounting for 34.54% of the variance, (2) LES ($F_{2,168} = 41.31$; $p < .0001$), accounting for 12.92% of the variance, and (3) KNOW ($F_{3,167} = 5.87$; $p < .02$), accounting for 1.78% of the variance. These three predictor variables accounted for 49.24% of the variance in explaining environmental behavior. Table 2 indicates the result of all respondents.

Table 2 goes about here

Conclusions and Implications. On the basis of the data analyses, considering the entire sample, there are three predictor variables that best predict overt responsible environmental behavior. These predictors are perceived skill in using environmental action strategies, level of environmental sensitivity, and perceived knowledge of environmental action strategies. Therefore, it can be concluded that the more skillful in environmental action strategies, the higher the level of environmental sensitivity, and the more knowledgeable of environmental action strategies an individual is, the more likely it is to predict that an individual will take more environmental actions.

The above conclusion implies the need for curriculum development and instructional practice in EE to address citizenship participation in environmental problem solving. Students need to be equipped with the knowledge of environmental action strategies which they can consider in problem/issue remediation. Furthermore, they need to be given training in order to develop skills and expertise in the use of these strategies in remediating the specific environmental problems facing them in their daily lives. The need for nurturing one's level of environmental sensitivity is also indicated by the results of the study.

The implications noted by this research corroborated Volk's (1983) recommendation that a goal-oriented curricula be developed and that educators be given appropriate training in environmental problem solving. Taking a step along this direction, the presentor attempted to incorporate the study's findings in a teaching model that promotes responsible environmental behavior.

II. A Model of Teaching Pro-Environmental Behavior

Theoretical Position. The results of the study lead to a theoretical position that an individual who is environmentally sensitive as well as knowledgeable and skillful of environmental action strategies will display responsible environmental behavior. This position is based on the following beliefs:

1. Responsible environmental behavior is the desired ultimate goal of environmental education.
2. Knowing the critical predictors of responsible environmental behavior will be useful in planning environmental education programs.
3. Since responsible environmental behavior is a learned response/action, it can be identified, developed, nurtured, and strengthened.
4. Knowing the variables which foster responsible environmental behavior should inevitably lead to strategies which take into account all the goals of environmental education - from the awareness level to citizenship action taking (problem solving).

Goals/Forms of the Model. Teaching for citizenship action (pro-environmental behavior) is based on the premise that responsible environmental behavior is the ultimate goal of EE. It aims toward the development of independent learners who are knowledgeable about environmental issues/problems and who are willing to take necessary actions toward their remediation.

The goals of teaching pro-environmental behavior are based on the goal levels for curriculum development in environmental edu-

cation as identified by Hungerford, Peyton, and Wilke (1980). These goal levels are: (1) ecological foundations, (2) conceptual awareness-issues and values, (3) identification/evaluation of environmental issues and problems, and (4) citizen action skills - training and application.

This model of teaching pro-environmental behavior has both nurturant and instructional effects as it sets to accomplish the delineated goals of environmental education. It nurtures the development of environmental sensitivity, environmental values and attitudes, and citizen action (problem solving) behavior. It has instructional effects as environmental problems are identified, as beliefs, attitudes, and values are clarified, as secondary sources and first hand methods in investigating environmental problems are explored, and as knowledge of and skills in using environmental action strategies are acquired and developed.

Syntax. The ultimate goal of this model is for students to engage in pro-environmental behavior. Essentially this model contains the following elements or phases:

Phase One. Sensing out - Exposure to the natural environment, using the senses, is aimed at developing environmental awareness/sensitivity.

Phase Two. Looking into environmental problems which immediately affect the students serves as the starting point for discussion on environmental problems.

Phase Three. Students' personal beliefs, values, and attitudes regarding environmental problems discussed are explored and clarified.

Phase Four. Students are given information and skills regarding tackling environmental problems.

Phase Five. Students are exposed to citizen action strategies and given opportunity to practise and develop skills in using these action strategies. Getting into citizen action is nurtured and is voluntary in nature.

Figure 1 shows the five phases of the Model of Teaching Pro-Environmental Behavior.

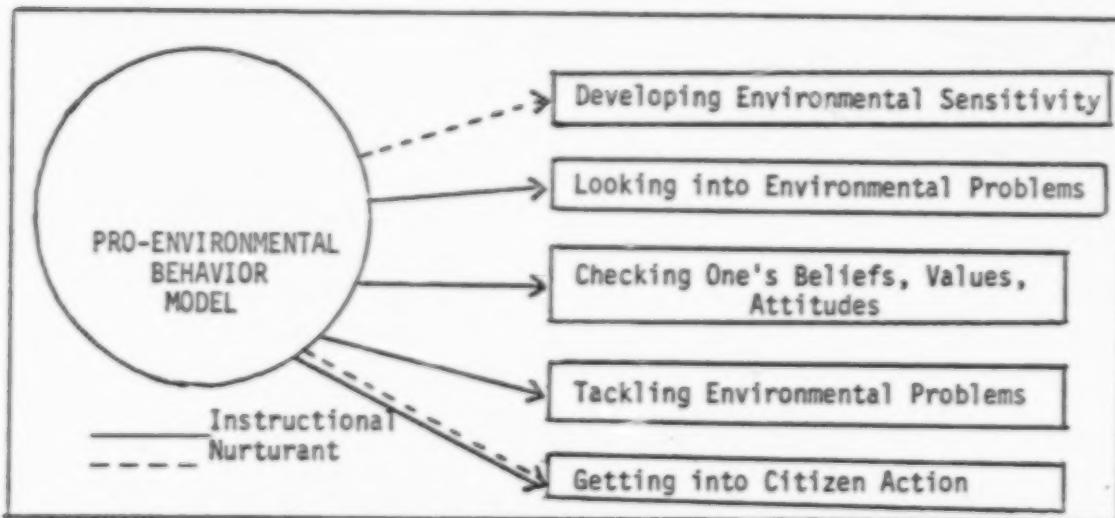


Figure 1. Instructional and Nurturant Effects: A Model of Teaching Pro-Environmental Behavior.

Phase One is the students' exposure to the environment aimed at developing environmental sensitivity (empathy). Unless an individual possesses a minimal amount of concern for the natural environment, it is unlikely that he/she would be motivated toward the resolution of environmental problems (Peterson, 1982; Tanner, 1980). Outdoor activities (e.g., nature walk, camping) may be conducted to foster environ-

mental concern. Techniques to heighten natural awareness through sensory and conceptual stimulation (e.g., testing, smelling, focusing, seeing, framing, orchestrating, empathizing) may be utilized in these outdoor activities. Discussion of the influence of role models (e.g., teachers, friends, family, author) in developing environmental sensitivity will be generated. This phase can be integrated in physical education, art education, language arts, and social studies.

Phase Two, looking into environmental problems, is a process whereby students, after their preliminary exposure to the environment, are guided to define the term "environment", prepare and communicate a list of at least ten environmental problems, define the term "environmental problem", and eventually communicate problem questions that are consistent with an identified environmental problem (Hungerford, Litherland, Peyton, & Tomera, 1978). This second phase may be tackled in science and language arts.

In Phase Three, the identified environmental problems should naturally lead to students' sharing their personal beliefs, values, and attitudes. Through values clarification, students are guided to explore the relationship between human values and environmental issues and to clarify their own value positions to the point where the individuals are willing to act on those environmentally related values. This phase, where assigned or self-selected activities are chosen to provide for the actual clarification of personally held values, critically requires that the teacher is proficient in carefully selected questions and strategies. This third phase is better tackled in social studies.

In Phase Four, tackling environmental problems, students are instructed on the use of secondary sources (e.g., use of references, and catalogue, readers guide), use of surveys, questionnaires, and opinionnaires in environmental investigations (Hungerford, Litterland, Peyton, & Tomera, 1978). This phase helps give the students the skill necessary for collecting information using secondary sources as well as research strategies useful to study problems in environmental situations on a first-hand basis. Most important is that students are given a chance to do research using any of the secondary sources and at least one of the research strategies (e.g., using survey). This phase can be handled in language arts.

Finally in Phase Five, getting into citizen action (environmental remediation), students are given an opportunity to learn how to use most of the strategies involved in environmental action. This is imperative in that recent research indicates that the critical predictors of responsible environmental behavior are skill in using environmental action strategies, knowledge of these strategies, and level of environmental sensitivity (Sia, 1984). Environmental action, as the key to the solutions of environmental problem, however, is strictly voluntary and therefore should be deftly nurtured by the teacher. What is instructive is the acquisition of knowledge of and the development of skills needed to take action necessary to remediate environmental problems. The students are therefore exposed to the development of knowledge of and skill in using six environmental action strategies, namely: (1) consumerism, (2) ecomanagement (physical intervention), (3) persuasion, (4) legal action, (5) political action, and (6) any combination there of (Hungerford &

Peyton, 1976). The students are likewise exposed to the efficacy of using individual and/or group action when putting into practice the above environmental action strategies. Before proceeding with environmental action, the students need to take into account thirteen action analysis criteria (Hungerford & Peyton, 1976) such as the following:

- 1) Is there sufficient evidence to warrant action on this issue?
- 2) Are there alternative actions available for use? What are they?
- 3) Is the action chosen the most effective one available?
- 4) Are there legal consequences of this action? If so, what are they?
- 5) Will there be social consequences of this action? If so, what are they?
- 6) Will there be economic consequences of this action? If so, what are they?
- 7) Do my personal values support this action?
- 8) Do I understand the procedures necessary to take this action?
- 9) Do I have the skills needed to take this action?
- 10) Do I have the courage to take this action?
- 11) Do I have the time needed to complete this action?
- 12) Do I have all the other resources (other than the above) needed to make this action effective?
- 13) What are the ecological consequences of this action?

Only when they shall have carefully applied the thirteen criteria in analyzing an environmental problem/issue can the students be encouraged to take environmental action. This phase can be handled in both science and social studies. In brief, this phase requires that in applying environmental action skills, students need to: (1) identify the problem, (2) write a summary of the issue, (3) write conclusion, (4) write appropriate actions, (5) apply the thirteen criteria questions, and (6) make recommendations.

Summary. This model is highly process-oriented. The strategies and the values and attitudes essential to an inquiring mind are given meaning by a teacher who is inductive, who masters the techniques of questioning, who allows verbal expressions of students, who is persistent but at the same time tolerates the lack of closure, who exhibits logical thinking, and shows scientific attitude. The chief outcomes of this model would be the development of individuals who act responsibly towards the environment. The format of this model promotes active, autonomous learning when eventually the students conduct investigations that require environmental action (problem solving) behavior.

A Final Note

The model of teaching pro-environmental behavior is based on a study investigating the critical predictors of environmental behavior. The phases of the model, both instructional and nurturant, indicate that they can be integrated in the school curricula, following an interdisciplinary approach. This five-phase model is aimed towards the promotion of responsible environmental behavior, which is the ultimate EE goal. If our preservice educators are given training in EE conducted in an interdisciplinary fashion, where they are

trained to develop skills in environmental problem solving, then we can hope that these prospective teachers will integrate EE in our nation's schools and eventually produce environmentally active citizens.

REFERENCES CITED

- Arbuthnot, J. The roles of attitudinal and personality variables in the prediction of environmental behavior and knowledge. Environment and Behavior, 1977, 9(2), 217-232.
- Borden, R.J. Attitudinal dimensions of environmentally responsible behavior: Disliking pollution, doubting technology and a little love of nature. Portions presented at Energy Conservation Symposium, American Psychological Association, New York, 1979.
- Borden, R.J., & Francis, J. Who cares about ecology?: Personality and sex differences in environmental concern. Journal of Personality, 1978, 46, 190-203.
- Borden, R.J. & Powell, P.H. Androgyny and environmental orientation: Individual differences in concern and commitment. In A.B. Sacks, L.A. Iozzi, and R.J. Wilke (Eds.), Current Issues in Environmental Education and Environmental Studies, 1983, 8, 261-275.
- Fryman, J., Middendorf, E., Murrin, M., Sia, A., Sivek, D., & Volk, G. A profile of environmental education research from the Journal of Environmental Education. Unpublished research document, Southern Illinois University at Carbondale, 1982.
- Hungerford, H.R., Litherland, R.H., Peyton, R.B., & Tomera, A.N. Investigation and Action Taking Skills for Environmental Problem Solving. Champaign, Illinois: Stipes Publishing Company, 1978.
- Hungerford, H.R., & Peyton, R.B. Teaching Environmental Education. Portland, ME: J. Weston Walch, 1976.
- Hungerford, H.R., Peyton, R.B. & Wilke, R.J. Goals for curriculum development in environmental education. The Journal of Environmental Education, 1980, 11(3), 42-47.
- Hungerford, H.R., & Tomera, A.N. Science in the Elementary School: A worktext (Revised). Champaign, IL: Stipes Publishing Co., In Press.
- Linke, R.D. Achievements and aspirations in Australia EE. Journal of Environmental Education, 1980, 12(2), 20-23.
- Maloney, M.P., & Ward, M.P. Ecology: let's hear from the people. American Psychologist, 1973, 28(7), 583-586.
- Nie, N., Hull, C., Jenkins, J., Steinbrenner, K., & Brent, D. Statistical Package for the Social Sciences. New York: McGraw-Hill Book Co., 1975.

- Peterson, N.J. Developmental variables affecting environmental sensitivity in professional environmental educators. Unpublished master's thesis, Southern Illinois University at Carbondale, 1982.
- Roth, R.E. Fundamental concepts for environmental management education (K-16). The Journal of Environmental Education, 1970, 1, 65-74.
- Sia, A.P. An investigation of selected predictors of overt environmental behavior. Unpublished doctoral dissertation, Southern Illinois University at Carbondale, 1984.
- Spence, J.T., & Helmreich, R.T. Masculinity & Femininity: Their Psychological Dimensions, Correlates, and Antecedents. Austin and London: University of Texas Press, 1978.
- Stapp, W.B. The concept of environmental education. The Journal of Environmental Education, 1969, 1(3), 31-36.
- Statistical Analysis System. Raleigh, N.C.: SAS Institute, 1979.
- Tanner, R.T. Significant life experiences: a new research area in environmental education. The Journal of Environmental Education, 1980, 11(4), 20-24.
- The Tbilisi Declaration. Connect, 1978, 3(1), 1-8.
- Tomera, A.N., Hungerford, H.R., & Wilson, R.J. Ten years of research in the Journal of Environmental Education - a brief analysis of vols 3-12. Paper presented at the Eleventh Annual Conference of the National Association for Environmental Education held at Silver Bay, New York, October 15-20, 1982.
- Van Matre, S. Acclimatizing. Martinsville, IN: American Camping Association, 1974.
- Volk, G.L. A national survey of curriculum needs as perceived by professional environmental educators (Doctoral dissertation, Southern Illinois University at Carbondale, 1983). Dissertation Abstracts International, 1983, 44(5), 1327A (University Microfilms No. 83-21, 474).

Table 1
Regression Analysis of Scores on the Eight Predictor
Variables of the Combined Sierra Club (SC) and
Elderhostel (EH) Samples Categorized into
High ($n=46$) and Low ($n=45$) Behavior Groups

$df = 1, 89$

Variable**		Mean	SD	F	Prob>F	Sig*
SKILL	High	14.83	3.53	60.61	0.0001	s
	Low	9.71	2.67			
LES	High	49.57	8.25	79.78	0.0001	s
	Low	35.11	7.4			
GLOC	High	4.04	0.84	17.64	0.0001	s
	Low	3.31	0.82			
KNOW	High	17.41	3.78	32.46	0.0001	s
	Low	13.13	3.38			
TECH	High	29.11	6.80	2.31	0.1318	ns
	Low	31.13	5.85			
ILOC	High	3.15	0/87	17.15	0.0001	s
	Low	2.42	0/81			
PAQ	High	2.07	1.12	7.59	0.0071	s
	Low	2.76	1.26			
POL	High	11.48	3.99	10.46	0.0017	s
	Low	14.56	5.04			

*s=significant at .05 level

ns = not significant

**Variables indicate:

- SKILL = Perceived Skill in Using Environmental Action Strategies
- LES = Level of Environmental Sensitivity
- GLOC = Perceived Group Locus of Control
- KNOW = Perceived Knowledge of Environmental Action Strategies
- TECH = Belief in/Attitude toward Technology
- ILOC = Perceived Individual Locus of Control
- PAQ = Used for Psychological Sex Role Category
- POL = Belief in/Attitude toward Pollution

Table 2

Stepwise Regression (MAXR) Analysis of Eight Variables
Used to Predict Overt Pro-Environmental Behavior
Considering Scores of All Respondents ($n=171$)

Predictor Variables	Percent Contribution	F Value	Prob>F	Sig [*]
Perceived Skill in Using Environmental Action Strategies ($df = 1, 169$)	34.54	89.16	0.0001	s
Level of Environmental Sensitivity ($df = 2, 168$)	12.92	41.31	0.0001	s
Perceived Knowledge of Environmental Action Strategies ($df = 3, 167$)	1.78	5.87	0.0165	s
Belief in/Attitude towards Technology ($df = 4, 166$)	0.97	3.24	0.0737	ns
Psychological Sex Role Classification ($df = 7, 163$)	0.93	3.14	0.0784	ns
Belief in/Attitude towards Pollution ($df = 8, 162$)	0.57	1.92	0.1673	ns
Perceived Individual Locus of Control ($df = 9, 161$)	0.36	1.25	0.2649	ns
Perceived Group Locus of Control ($df = 10, 160$)	0.08	0.24	0.6261	ns

* s = significant at .05 level

ns = not significant